FEASIBILITY STUDY OF USING AN ALTERNATIVE FUEL IN SRILANKAN CEMENT INDUSTRY.

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DECLARATION

I certify that this thesis does not incorporate without acknowledgement of any material previously submitted for a Master Degree in any University. To my best knowledge and belief It does not contain any material previously publish, written or orally communicated by another person except where due reference is made in a text.

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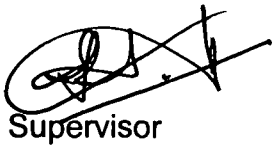
To best of my knowledge above particulars are correct.



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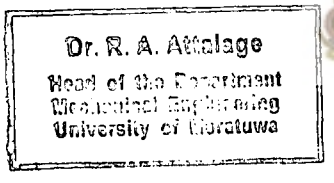

ABSTRACT

Use of waste material as an alternative fuel in the cement industry is a global best practice. It helps cement industrialists to lower thermal energy cost drastically. Being cement industry being energy intensive, thermal energy cost accounts for 30 to 40 % of production cost. Therefore, reduction of the thermal energy cost leads for cost leadership a vital competitive priority in any industry. Some of the cement companies in a developed world achieve zero fuel cost by burning waste material as an alternative to traditional fuel. This practice helps to save scares natural resources of fossil fuel as well as to preserve environment by disposing waste.

This study was carried out to investigate the feasibility of burning waste material in the Sri Lankan cement industry. In there is only one fully intergraded cement plant. It is Puttalam cement works that belong to HOLCIM Lanka. Puttalam plant at Holcim Lanka produces clinker out of local raw materials. It produces 20% of the countries cement requirement. Hence, this study is limited to only Puttalam cement works.

Study shows there are many types of unutilized waste materials available in Sri Lanka, which can be burnt in cement kilns as an alternative fuel. But major constraints are the loose environmental regulations over the waste and logistic problems. Because of a lean environmental regulation waste producers are not motivated to send their waste to disposal centers at their own cost. Also most of the potential waste materials are scattered in large geographical areas in a small quantities making logistic difficult and expensive.

Study shows even with these difficulties, it is economical to burn selected waste materials at cement kiln at Puttalam. But potential waste material sources are limited to few districts around Puttalam due to logistic constraints.

This also shows that the current level of technology at Puttalam plant is insufficient to burn waste material successfully. Plant needs a technological transfer in a relevant to techno ware, orgoware, humanware and inforware.

With adequate technology transfer, it is possible to burn selected available waste materials at Puttalam Plant to achieve minimum 15% thermal substitution rate. This will lead to reduction of cost of production by Rs.100/- for every ton of clinker, as plant at Puttalam produces around 500,000 Metric tons of clinker per annum. There is a potential to save minimum Rs 50 million per annum. If logistic of waste material is improved, there is a greater potential to save cost more to achieve cost leadership in a cement industry in Sri Lanka a gateway to achieve competitiveness in a industry.

But always there is a risk for future availability of waste material at zero cost. There may be demand for the waste material from other industries particularly a development of small-scale power plant. Regarding any investment over the use of alternative fuel proper risk assessment will be required

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List of Abbreviation

$Al2o_3$	Aluminum Oxide
AR	Alumina Ratio
AFR	Alternative Fuels &Raw Materials
AF	Alternative Fuels
ASEAN	Association of South East Asian Nation
BG	Batalagoda
Br	Bromium
BW	Bandarawela
C	Carbon
CBT	Concrete base industries
CCR	Central Control Room
C_3A	Tri Calcium Aluminate
CEO	Chief Executive Officer
C4AF	Tetra Calcium Aluminate
Ca_o	Calcium Oxide
Cd	Cadmian
Cl	Chloride
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CR	Chromium
C2S	DI Calcium Silicate
C3S	Tr calcium Silicate
CV	Calorific Value
EMS	Environmental Monitoring System
FE2O3	Ferrous Oxide
FF	French Frank
F	Fluoride
H	Hydrogen
H -4	Hambantota
H_2O	Water
HCL	Hydrochloride
Hg	Mercury
HVL	Holcim Vietnam Ltd
IO	Input/Out put
K_2O	Potassium Oxide
KG	Kilo Grams
KKS	Kankesanturai Cement Works
Lindel	Lindel Lanka Laboratories
LSF	Lime Saturation Factor
Mgo	Magnesium Oxide
MI	Maha Iluppallama

MJ	Mega Jules
MT	Metric Ton
N/A	Not Available
N_2O	Sodium Oxide
Ni	Nickel
NO	Nitrogen Oxide
NO_2	Nitrogen Di Oxide
Nox	Oxide of Nitrogen
Ph	Lead
PLC	Programmable Logic Controllers
Q	Question
QTY	Quantity
Rs	Srilankan Rupees
S	Sulphur
SAARC	South Asian Association & Regional Corporation
SCCC	Siam City Cement Corporation
SPM	Suspended Particular Matter
SO_2	Sulphur Dioxide
SO_3	Sulphate
SR	Silica Ration
TEE	Thermal Economic Equelent
Ti	Titanium
TiO2	Titanium Oxide
TSP	Total Suspended Particular
TSR	Thermal Substitute Rate
U$	American Dollars
Zn	Zinc

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